Nurturing Technically-grounded Leaders and Innovators through Cross-disciplinary Education, Research and Entrepreneurship

The Fourth Industrial Revolution: How will it change Singapore’s higher education landscape?

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Digital transformation has ushered the world into the 4th Industry Revolution.

1st Industry Revolution
18th Century

Steam Engine

2nd Industry Revolution
19th Century

Electric Power

3rd Industry Revolution
20th Century

IT, Computing and Communications

4th Industry Revolution
21st Century

End-to-end Digital, Intelligent Systems
AI, IoT, Robotics, Data

Mechanization → Electrification → Automation → Autonomy
Impacts of Industry 4.0

- Cutting across industry, economy and society

Nature of work and job:

Jobs are replaced by advanced robotics and machine intelligence at a faster pace than being created.

Innovation Economy:

- New Currency: Information & Data
- New Form of Capital: Creative Talent & Cross-disciplinarity
- New Skills: AI, Data Analytics & 3D Printing

Empowering the Individual:

Ordinary people have access to the digital networks to acquire knowledge, communicate with one another, and conduct businesses.
## Industry 4.0: The Future of Jobs

**Jobs replaced by robots/machines**

1. **Mid- and Low-skill jobs involving manual and routine tasks**

2. **“Newer” jobs: Cross-disciplinary knowledge, creative, innovative, personal and communication skills**

**Employers:**
- Re-training of employees and new management and reward systems

**Employees:**
- Embrace new technologies and learn something new multiple times in their lives

**Cross-disciplinary learning & Growth mindset** for continuous and lifelong learning
How can universities better prepare graduates and contribute to lifelong learning in the era of the 4th industry revolution?
Transforming Higher Education Learning

Key Areas:

1. Break down silos, bring together:
   - Cross-disciplinary learning
   - Digital competency
   - Global exposure
   - Human-centric education
   to serve societal needs

2. Skills & Attitudes beyond book knowledge:
   - Creative Thinking
   - Problem-solving
   - Communication
   - Social & Emotional skills
   - Growth mindset for Continuous Learning & Entrepreneurship

3. Flexibility, Choice & Diversification:
   - No one-size-fits-all approach
   - Let students choose a pathway that suits their talents and interests

4. Pedagogical Innovation combining:
   - Active & Interactive Learning
   - Digital Technology both on- and off-campus
   scalable to large & diverse student cohorts, including alumni and adult learners

5. Integrated Partnership with Industry encompassing:
   - Education
   - Research
   - Internship
   - Overseas Exposure
   - Up- & Re-skilling
   - Entrepreneurship
Breaking down silos and bringing together cross-disciplinary learning, global exposure and human-centric education

**Traditional Engineering Disciplines:**

**Specific Disciplines:**
- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Etc...

**Specific Industrial Segments:**
- Aeronautical Engineering
- Chemical Engineering
- Nuclear Engineering
- Computer Engineering
- Etc...
Evolution of Engineering Education

Source: 101 Things I Learned in Engineering (John Kuprenas)
SUTD: A cross-disciplinary, human-centric education and a growth mindset of innovation and entrepreneurship

What the World needs

- PRODUCTS
- SERVICES
- SYSTEMS

Strong Foundation
Discovery of interest

Humanity, Arts
Social Science
(HASS)

Digital
Competency
AI, ML, DA,
Statistics

Design Thinking
Innovation

BIG-D

ARCHITECTURE & SUSTAINABLE DESIGN

ENGINEERING SYSTEMS DESIGN

ENGINEERING PRODUCT DEVELOPMENT

Human
(Needs, Desire)
Develop Skills & Attitudes beyond book knowledge

**Attitudes**
- Passion
- Collaboration
- Growth mindset
- Dissatisfaction with the status quo
- Willingness to take risks and fail
- Can-do spirit

**Skills**
- Creative thinking
- Problem solving
- Social and emotional
- Empathy
- Communication
- Lifelong learning

**Knowledge**

**GLOBAL EXPOSURE**

**EXPERIENTIAL**
Flexibility, Choice & Diversification for DIFFERENT PATHWAYS

- Not one-size-fits-all
- Allow students to choose a pathway that suits their talent and interests
- Offer flexibility for students to self-direct and pick a menu of courses that is more oriented to their future career
Flexible and modular curricula coupled with digital platform to allow learning across multiple avenues

Ref: Sanjay Sarma, Speech at SUTD Academy launch
Integrated Partnership with Industry:

- **KEY INDUSTRY SECTORS**
  - Healthcare
  - Cities
  - AI
  - Aviation

- Invest in re-training by sending employees back to “schools”
- Work with IHL for training certification and credential
- Expand Internship opportunities for students, locally and overseas
- “Partnerships” with industry to provide “sector-based” curriculum
- Build R&D capabilities to support the sector
- Make internship mandatory
- Re-train and upskill workforce to bridge the competency gaps
- Nurture a ready pool of technically-grounded graduates to meet industry’s demand for “newer” workers
Reimagining Higher Education: - The BIG Questions

The 4th Industrial Revolution

Intellectual Footprint?
Organizational Structure?
Curricula & Degrees?
Teaching Approach?
Research Approach?
Lifelong Learning?
Use of Digital Technology?

...?